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September 1998



FIRST CLASS MAIL



Pikes Peak Radio Amateur Association, Inc.
P.O. Box 16521
Colorado Springs, Colorado 80935

1 Renew before 03/31/00
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 NK0P
 4305 RIDGELANE DR.
 COLO. SPGS., CO 80918



O-Beat



Pikes Peak Radio Amateur Association Officers and Directors

President:	Greg Tarcza	WA2OOD	597-7064	gregt@col.hp.com
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& Past Pres:	Jeff Boyes	N0JLH	229-5703	jboyes@usa.net

*This Officer/Director is completing the second year of the two-year term to which they were elected.

The *O-Beat* is published monthly in the interest of the members of the Pikes Peak Radio Amateur Association, Inc., PO Box 16521, Colorado Springs, Colorado 80935. For membership and subscription information see the last page of this publication. Monthly advertising rates: Full page, \$48; Half page, \$24; Quarter page, \$12; Business card, \$6. These rates are billed quarterly. Send your ad requests and payments to: PPRAA, PO Box 16521, Colorado Springs, Colorado 80935.

Check out the PPRAA page on the World Wide Web! Go to: <http://www.qsl.net/ppraa>

Deadline for submission of articles or advertisements is the Monday after Board meeting. Submissions are accepted in any form. Articles should be sent directly to the *O-Beat* Editor (Email to kd0ju-1@juno.com is preferred.) Permission is granted to reprint articles provided credit is given to both the author and this publication.

License Exams

License examinations sponsored by the Pikes Peak Radio Amateur Association are held on the 2nd Saturday of February, April, June, August, October, and December.

Testing takes place at 9 A.M. at:

Denver Technical College
225 South Union
Colorado Springs

Everyone is seated on a walk-in basis. Those wishing to take an exam should bring the following items:

1. \$6.35 (preferably a check/money order made out to ARRL/VEC) for any exam other than element 1A or 2.
2. Picture identification.

3. A copy of your current amateur radio license, and/or a copy of any examination credit you have, as well as the signed original. We keep the copies.

4. A pen, pencils, and a calculator if you need one.

If you have any questions, call Erik Mugele, KG0XE at 596-5345. Please do not call Denver Technical College.

Committee Chairpersons/Contacts

O-Beat Editor	Bill Pierce	KD0JU	550-0406
Activity	Pete Petry	WD4DHR	??-???
Auditing	Any Volunteer's?		
Asset	Mike Stansberry	K0TER	636-1290
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Interference	Bill Petty	N0NJX	532-1439
Membership	Les Borst	KC0NC	634-3995
Programs	Jeff Boyes	N0JLH	229-5703
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Public Service	Mike Stansberry	K0TER	636-1290
Swapfest '99	Bob Ryalls	KI0GF	??-???
Technical Instruction	Linda Hedges	KB0RKW	520-9238
VE Testing	Erik Mugele	KG0XE	596-5345

Other Organizational Liaisons

ARES Liaison	Mike Stansberry	K0TER	636-1290
CCARC Liaison	Ron Deutsch	NK0P	593-8352
RACES Liaison	Bryan Curl	N0LUF	575-8400

Reminder — General Membership Meeting

The next General Membership meeting of the Pikes Peak Radio Amateur Association will be on the second Wednesday of this month at the Mt Calvary Lutheran Church, 1318 N.Circle. The meeting will start at 1900.

September Program Notice

Bob Witty, KBØCY will be talking to us about test equipment.

Treasurer's Report

de N7LV

(for the period 6/1/1998 to 7/31/1998)

Income - Expenses = Gain/(Loss)

\$107.25 - \$671.36 = (\$564.11)

Jackets: Those of you that ordered club jackets in July or earlier, they're finally in. I show that WD4DHR, KC4VMB, NØENN, KA2KER, KBØREI and NØMUD have ordered jackets. I also have one other person that wants to order a jacket. Orders less than 11 jackets are assessed a \$10 set-up fee. One person could order a jacket and pay the \$10 fee. However if anyone else wants to order a jacket as well, they'll split the set-up fee, reducing the cost. Anyone else want to order a jacket? The price is right about \$32, plus your share of the set-up fee and sales tax. Also, those that ordered the commemorative Mir contact sweatshirts, they're in as well.

Misc: I was out of town for most of July so that's why the 2-month report instead of a 1-month report. July was busy - business during the first half, vacation during the second. While in GA I dropped in on the Amateur Radio Club of Augusta club meeting, and enjoyed meeting a bunch of nice people and seeing the Icom Funmobile there. Their meeting was a little unusual in that it was outdoors, but only because of the Funmobile. After a brief business meeting, we were treated to a tailgate program by Chuck W4MEW on the origins of the 2-meter band, and his small display of some early 2-meter gear. A tour of the Funmobile followed. Talk about lots of radios!

There were probably 50 different radios on display, including amateur, commercial, marine, and gen-cov receivers. Some of the radios were set up for operating. They also had APRS installed, but it wasn't working that day. Coincidentally, some ARCA members and the Funmobile are both pictured in the August QST, on pages 19 and 32, respectively. You can see the Funmobile on the web at <http://www.icomamerica.com/> and if you follow the links to their visit to Augusta on July 14, you can see me with some other ARCA members in front of the Funmobile! I'm just to the left of the guy with the yellow shirt, in the center. ARCA has a DAILY net, and they get many check-ins each day. I didn't check in every day, but it was nice to know you can get current information daily on that net. Quite a hospitable group!

September, 1998 President's Corner

Thanks to all who provided their time and expertise to the Pikes Peak Enduro a couple of weeks ago. The organizers really appreciated our help with the event, as did the couple of injured riders. Thanks are also due to all of you who helped make our annual picnic a success. I enjoyed it, as did a lot of other people.

We've got two more chances in the next month to show off amateur radio. The first opportunity will be Saturday, October 3rd at the East Branch Library exhibit. Most of the work involved with this exhibit involves talking with visitors to tell them what we do. Most of us are capable of doing that without working up a sweat, no? Let Aaron, KD6FLM, know that you are willing to support him and the club by helping. Aaron will also need support with a couple of stations and operators, too.

The second event is the Jamboree On The Air (JOTA) which will be the weekend of October 17th at Fort Carson. Things are starting to come together for this one, but we still need more people to volunteer their time and an occasional HF station to support the effort. Again, we've got a great opportunity here to show off the club and our hobby. We've also got a shot at getting some of our local Boy Scouts hooked on amateur radio. For all of you who have said that the club should be more involved

in public service, this is a good time to step forward and back up your words with some action. We've got a good group of Scouts to work with and you might just have some fun in the process.

Thanks are in order for Pete, WD4DHR, for taking on the role of Activities Chairman at least through Christmas. He's got some good ideas for a good Down Home Radio kind of Christmas party that you won't want to miss. Please note that we will still need another Activities Chair by the beginning of next year. Please consider helping us out in this position. Remember, you don't have to do all the work yourself - you just need to organize a few other folks than can!

Not much else is happening - my son, NØYTO, came home from the Navy for a couple of weeks (I immediately put him to work cutting branches off my tree - you know, the one that keeps sucking up my RF). Carlos's ham class should result in two graduates shortly. We've got another request from a Scout troop to teach a class for them. After the two October events I mentioned, things should start to wind down for the year and we can start planning for next year. If you get a chance, give me a call sometime and let me know how you think the club is doing this year.

That's all I've got for this month. I'll see you at the meeting.

Greg Tarcza, WA2OOD

Jamboree On The Air

Date: October 17th All day

Setup: October 16th Afternoon/Evening

Takedown: October 18th Morning

JOTA is almost here, it is our chance to help Scouts make friends from around-the-world or around-the-corner. It is also our chance to show Scouts what amateur radio is all about. Check out the **September issue of QST page 90**, or, if you happen to be a WEBster, see

<http://www.arrl.org/ead/> and follow the link to "ARRL Scout Handbook" or the link to "JOTA: Jamboree On The Air".

This year, in conjunction with the Order-Of-The-Arrow (OA) Fall Camporee, we will be hosting about 1,000 Scouts for JOTA. To do a good job, a lot of people will need to be involved, and a lot of stations.

I have the following stations in mind:

3-HF stations

1-CW/RTTY/Digital

2-VHF/UHF stations

1-Message Handling

1-AMSAT

1/2-ATV (monitors at different locations)

An additional activity, which the Scouts will be doing for competition is Orienteering... but, with a twist. We will be giving the instructions (headings and distances) over a 2-mtr simplex net. This will take a net-control operator and a handful of radio operators in the field.

Please help with JOTA! We need people to help organize, volunteer as operators, or volunteer equipment (radios, antennas, masts, generators, tents...etc).

Anyone good at writing articles? If his China trip isn't extended, it looks like I may have a professional photographer from Kodak coming along (Steve - wd0eqw). Still, we are in need of someone that can write. I'd like to see the area radio clubs and Scouts be published in QST or Scouting.

Your help will be greatly appreciated. I'm sure you will enjoy helping Scouts make new friends, introduce them to a new hobby, or introduce emergency service communications.

Please volunteer, give me a call or send an email !!

Contact: Dan Scott

Call: kb0ppm

Phone: 719-635-0871 (home)

719-535-1243 (work)

email: dan.scott@bigfoot.com

73,

Dan kb0ppm

General Membership Meeting

Minutes for August 12, 1998

Welcome to the General membership meeting for August 12. Greg WA2OOD, by dropping the gavel twice, opened the meeting at 7:02. Greg's announcements were to thank everyone for their help in the Endure event, and also mentioned the good response on the Thursday simplex nets. Moe, also had an announcement that, Ginger N0UOD and Roger KB0RLF are looking for people to help with the Elmer nets. Please contact Ginger N0UOD or Roger KB0RLF. Moe also mentioned her new Job at Colorado Springs Health Partners. We all congratulated her on her new position.

There were no corrections to last month's minutes, and they were accepted, as printed in the Ø-beat.

Treasurer's Report, Rob N7LV will submit a separate treasurer's report. He mentioned that the jackets, that have been ordered, will be ready in a few days.

Greg WA2OOD, read us two letters he received. One letter was from the ARRL, congratulating Frank McNally, KF0WF, for his outstanding performance as an instructor, and was awarded Instructor of the year. The second letter, from the Pikes Peak Partnership, was to say thanks to all of the members for their help.

Committee Report, nothing new to report.

Activities; We are in need of an activities chairperson. Rob N7LV is going to finish coordinating the picnic. Pete Petry WD4DHR and Bob Ryals KI0GF are helping with perishables, orange drink and other good stuff for the picnic. A tailgate is also planned if you have items to sell. Please help, as we are still in need of any suggestions for the upcoming Christmas party. It will need to be planned soon as there are only a few more month's left.

Historian Jody, KA0ROZ, had nothing new to report except, that she is getting articles from old Ø-beats, and some of them are very interesting. Rob N7LV, gave Jody a booklet containing some articles, and letters, for the Mir contact, to be put in the historian file.

Interference; Bill N0NIX, got a call from a man in the area of Union and Kiowa, that had power line noise 20 over, and could be heard on a 2 meter Handheld. Bill investigated this, and he knows which pole it is on. There is some 30,000 volts on this line and it has to do with the city. Since it also messes up AM radio the city will look into it. So the problem has not been solved yet.

Membership; Les KC0NC, had no report, except for July only, we're allowing an extra month grace period due to the treasurer's travel schedule, so please get your membership renewals taken care of as soon as possible.

CCARC: Ron, NKØP, wanted to remind everyone about the upcoming meeting in September, on the 26th at 1:00 pm at the Falcon Police Station. He had nothing else to report at this time.

Programs: Jeff NØJLH, was unable to attend the meeting as he was caring for an ill child. We have a program for September. Bob Witte, KBØCY will be presenting a program on Test Equipment. It should be very interesting.

Publicity: Ron NKØP would like some volunteers for the simplex nets. If you could take a net in the future please contact Ron NKØP.

Technical Instruction: Linda KBØRKW, There will be a HF Transceiver construction class starting in the fall. The first class will start on Sunday, September 27th, from 1-5 pm for 8 weeks. Frank KFØWF will be teaching and Dave ABØGO will be helping in this class. It will be at the Tesla Society, 2220 E. Bijou. Learn transceiver theory of operations, electronic construction, and testing techniques, as they build a 3w superhet, cw transceiver for 80, 40, 30, and 20. It will be called the SW+ descendant of NE 40-40 low power. Cost is \$100.00- includes transceiver kit, and cabinet. Participants supply own tools in addition to solder iron and other small tools. Advanced registration in required, contact Dave 594-9201, or e-mail at EKDAVE@earthlink.net by August 31. Payment is due by September 7. Minimum 10 registered for classes to take place.

Ø-Beat: Bill KDØJU had no report, just to remind people of the August 24th, deadline for all articles to be in at that time.

Old business: Dan Scott, KBØPPM, for JOTA, for this year we are in need of more than 20 people to help out with this event since there are about 1,000 scouts registered. We will need help with set ups of stations, tents, take down. If you can help, please contact, Dan Scott KBØPPM.

Library Exhibit Aaron KD6FLM still needs a couple of stations set up, and at least one HF station. The exhibit is coming up soon. Aaron will need to set up a meeting.

John Herring W8EGF gave a status report on the upcoming division convention being discussed for the year 2000.

VE Testing: At the last VE testing, there were more VE's than applicants, usually we have more test-takers than examiners. Also, it is rare to have a test session where no one takes the code test. Sign of the times, maybe.

New business: Joe, KQØS, brought up some discussion about the recent proposals for changes in licensing structures, by dropping of the 20 wpm code. The FCC is asking for input on the new code requirements, please read the information on the web about this.

No door prize this month. Rob N7LV still has a lot of duplicate QST's that he is trying to find a good home for. If, any one would like to have them for the interesting articles, contact Rob N7LV.

Hammy: This month was awarded by Greg WA2OOD, who added a small copy of the "Now your talking" book, to Carlos KBØREI for his great job with working with the kids for the ham classes. A mention was made to maybe have Jr. High students next year to participate in this class.

The next board meeting will take place at the picnic at 2:00pm on August 16, 1998. The picnic will be held at the Air Force Academy picnic area #3.

Program: Greg WA2OOD and Bill NØNIX, did a wonderful job on construction techniques on the direction finder kits. Greg built a box and explained soldering techniques. It was an interesting program. There were different types of flux for different jobs. Many old boards were shown to us.

The meeting adjourned at 9:53 local.

Submitted by Paula KCØAGG secretary.

**OM/YL
LUNCH BUNCH**

The Lunch Bunch get together will be September 10th. Note that this is earlier in the month than we were meeting. I hope that this will be alright with everyone, lets give it a try.

We'll meet at the Hometown Buffet, 3650 Austin Bluffs Pky at noon time. Everyone is invited.

73

Rosie Calaway, WAØMNL
471-9965

**Board Meeting Minutes
August 16, 1998**

Members present were Greg WA2OOD, Jody KAØROZ, Les KCØNC, Bill KDØJU, Moe WBØRTF, Rob N7LV, Jeff NØJLH, Ron NKØP, Bill, NØNIX, John W8EGF, Pete WD4DHR, Rosie WAØMNL, and Paula KCØAGG. Absent was Aaron KD6FLM.

President Greg WA2OOD, forgot his gavel and hand computer, do to the fact he was having so much fun at the picnic. The meeting started at 2:02. Greg, thanked Rob N7LV, Ron NKØP, and all who helped to put the picnic together, since (he does not want to forget any one) for without them, it would not have been a success.

Bob Ryals is our Swapfest chairperson. We will need to start to organize prizes for the swapfest.

Rosie WAØMNL wanted to say that, thank you notes had been sent to everyone who helped organize the swapfest.

Rob N7LV, is not sure if all of the people that helped with Field Day, have been reimbursed, he thinks so. Tom NØNTX was reimbursed \$105.00 for expenses.

CCARC: Ron NKØP requested the authorization of \$25.00 for CCARC refreshments. Ron NKØP made a motion, KDØJU second, motion passed. Ron NKØP made a motion for the club to authorize to pay \$25.00 for yearly dues, KDØJU second, and the motion passed unanimous.

John Herring W8EGF, has asked the board to consider, some kind of committee for Field Day. We would like to see more support from the city. We hope to start coordinating in January. We will need some people to help with liaison. The second issue that John mentioned was to have a convention of some sort, with possibly four different programs. Make the convention a swapfest/programs convention. Suggestions for programs would be like, antenna building, or other programs. There would be a list of the different programs, and we would be able to get enough speakers to do this.

John Herring W8EGF, said that he would be Field Day chairperson, with Mike Stansberry KØTER. Greg WA2OOD, made a comment that we might be able to get N8ASB from Dayton to help gather information on running a convention. N8ASB, is a Dayton Amateur Radio Association member, and he was visiting us at the picnic.

Programs: Jeff NØJLH, said that Bob Witte KBØCY will present a program on Test Equipment for the September meeting.

Jody KAØROZ, mentioned that Ken Phillips would do a program for November on Medical teams.

Moe WBØRTF, will make announcements for next months program, and to remind everyone to check into the simplex nets on Thursday nights.

Ron NKØP, would like people to help with the simplex nets. He reminds everyone that it needs no script to do. Moe will be net control for Aug 27th, and Rob N7LV will be net control for September 3rd.

Pikes Peak Radio Amateur Association

Bill KDØJU, needs stamps until the end of the year. John W8EGF suggested that we get a postal stamping machine, but since we are not a corporation, it may be difficult to do this. Jeff NØJLH said that he would find out more information about this.

Historian Jody KAØROZ, is still working very hard, going through old Ø-beats, article by article to get the history of the club up to the present date, to put in the historian file. She said "it will take some time, but she will get the task done".

Bill NØNJX, is concerned we are not going to be able to fill the seats for the board for next year, and wonders what to do. We still are in great need of an activities chairperson.

Bill NØNJX motioned that graduates of classes be given a 6 month free membership for the club, Bill KDØJU second. BILL NØNJX, and BILL KDØJU amended this motion. The motion now reads that a certificate and a copy of the Ø-beat, to bring to the General meeting, the club would then issue a 6 months club membership free, for graduates of the class. Bill NØNJX motioned, Rob N7LV second, and the motion carried.

Pete Petry WD4DHR has volunteered for the position as activity chairperson until the Christmas party in December, with the board's approval.

Greg WA2OOD, suggested telephoning members to get prospective candidates for positions for board interests. We had six people volunteer to do this by the next board meeting.

There was some discussion about setting up a proofreading meeting for the Ø-beat, Rob N7LV, and Greg WA2OOD said that they would help about 3 days prior to the deadline.

Bill NØNJX motioned that the meeting be adjourned at 3:11 pm., KCØAGG second, and passed unanimously.

Submitted by Paula KCØAGG Secretary

Colorado Council of Amateur Radio Clubs

The Semiannual meeting of CCARC will be hosted by our Club this September 26th at 1PM at the Falcon Substation, 7850 Goddard St. in Colorado Springs.

After the business meeting Nick, KG5N, will present a program on constructing Ham Radios gear.

All are invited to attend. For more information contact Ron, NKØP at 593-8352 or e-mail deutschra@aol.com.

El Paso County HF Roundtable

Sunday evenings just after the El Paso County RACES 7:30 PM (local) HF net, on 28.385 mHz.

Everyone is invited to check in.

DITS & BITS

For sale from Jim, KGØAE

- One (1) YAESU HT Model 530 Dual Bander with two (2) 7-watt batteries and NC 24 Quick Chgr, lapel mic and clip, plus manual.
All for \$100.00 or best offer.

-----/-----

- One (1) Kenwood Model TH-28 2-meter HT and Chgr with manual. \$90.00 or best offer.
Will sell separate or together. Make offer.
Jim Suddarth --KGØAE
392-5675

For sale from George, WBØDUM

- ICOM 211 All Mode 2 Mtr Trans.
- Mast, Telescoping 40 Ft
- KLM 140 Watt 2 mtr amp
- 8" Wall mount brackets
- Misc. computer boards
- Scanner antenna

Contact George for prices and other info at 495-3983

For Sale from Ginger, NØUOD

- Kenwood KR-V7040 Receiver, Ampli-tuner, Receptor, AM/FM Stereo
- Pioneer CLV-1-7- Laser Disk Player

All for \$250! Call Ginger at 528-8361 for more info

FOX HUNTS!

The Colorado Springs Fox Hunters will have a fox hunt on Sunday Sept 13 in Colorado Springs. We will meet in the parking lot in front of Radio Shack at 3659 Austin Bluffs Parkway (just west of Academy and Austin Bluffs intersection) at 1:45 PM. Starting mileage of the hunters will be taken, and at 2:00 PM the hunt will start. The fox will Dave NØUVR. Talk in will be on the 146.97(-) repeater and 146.58 simplex.

For more information contact:

Dave NØUVR

dfk@col.hp.com

Visit to HQ ARRL de N7LV

While on the East Coast for a wedding in late July, I deduced I was close enough to Newington CT to pay a visit to ARRL HQ (Delaware is close enough, isn't it?) so off I went. We, actually, as my wife and daughter Dorothy and Krista came along, but they really weren't as interested as I was.

225 Main Street is located on a fairly large lot, nestled in a quiet residential area in Newington. The first clue you have that you're getting close is the 120-ft towers protruding above the trees. If it weren't for those towers, you might miss it if you blinked twice. Amazingly enough, they haven't had many complaints at all about RFI, considering they're surrounded by lots of homes in an older neighborhood. (More pictures at <http://www.qsl.net/n7lv/w1aw.htm>.)

There are two buildings at ARRL HQ. The original building is still there (built in 1938, although renovated in '63 and '89) and houses the W1AW bulletin and code practice stations, as well as three fully equipped operating stations for visitors. On the day I visited, I was the only one there besides the custodian of the stations.

Sometimes all three stations can be in operation, and rarely there will be a waiting list.

But my visit began in the second, newer building (built in 1988) which houses the 100+ member staff and a small radio museum in the lobby. After signing in on the visitor logbook, we were politely greeted by the tour guide (not yet a ham, but working on it). Our tour group was just the three of us. The guide took us to all areas of the two-story building. We saw the QSL bureau, the equipment testing lab, the publications rooms where they produce QST and other books, and the high security area where they keep the tests for use by the VEs. (I don't know the actual level of security, but the area looked like a holding area that you might find in a US Custom's facility.)

The tour lasted about 45 minutes. During that time, though, I did meet some of the people that I've corresponded with over the years, like Gail Iannone, who handles swapfest and convention planning, Bart Jahnke who runs the VEC program, and Jean Wolfgang, who handled the awards process for Frank McNally's IOY award. One person I wanted to meet, Rosalie White, who coordinates the selection of schools for the SAREX/Mir program, was out of town. But she'll be attending the Boulder ARC swapfest in late September so I hope to meet her there.

Finally, after the tour, I still had some time left to tour and operate W1AW. But before operating I had to take a look around at the multitransmitter site where they transmitted bulletins and code practice on eight bands. The station uses military spec'd Harris HF SSB xcvsr with 1KW broadband amps which have a 100% duty cycle and are very stable. They operate on seven HF bands, plus 2 meters. The 2M station uses a Kendecom MT-4 repeater xmr, which also has a 100% duty cycle, and a Motorola 200W amp. Antennas are mostly Cushcraft monobanders, installed at varying heights on the 120 ft Rohn towers. They use in-house software for their PC to generate the RTTY and CW for their bulletins. The station I operated was equipped with a Yaesu FT-1000D and performed well enough for me to work some DX into Europe. Quite a nice setup! I would've liked to stay longer, but had to leave. It was definitely worth visiting! Thanks to Joe, NJ1Q, for the information about the station.

Which AA battery lasts longest?

Sara Witte, KC8AMO

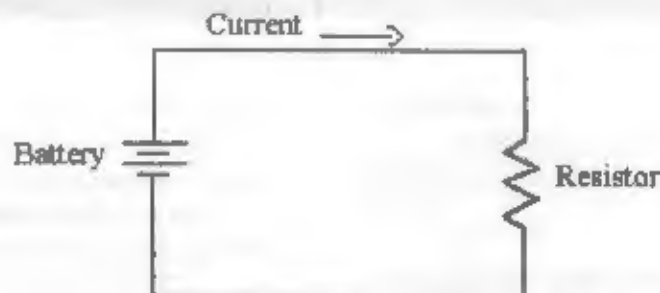
Chalenger3@aol.com

We've all been in a situation where unexpectedly the battery in our flashlight goes out, or in the middle of our favorite song the artist sounds like Darth Vader. Sometimes you happen to have a backup set of batteries, but if you don't you end up running to the store, hoping to spend a couple of bucks on some simple batteries, right? When you get there you find that, among the different sizes and prices, there are dozens of types. Some brands tend to cost less, but do they really compare with the other higher priced brands? Then there is the fairly new kind: lithium. Those cost a bundle, but will you get your money's worth?

Those are the kinds of questions running through my head when I was preparing an experiment for the Pikes Peak Regional Science Fair. I wanted to see which kind of battery lasted the longest, and which one was the better buy. I chose to test four different AA batteries: Energizer alkaline, Duracell alkaline, Energizer lithium and Eveready Classic zinc carbon. The two alkalines were the average AA battery, the lithium was higher priced, but claimed to last longer, and the zinc carbon was a low-priced battery.

Experiment

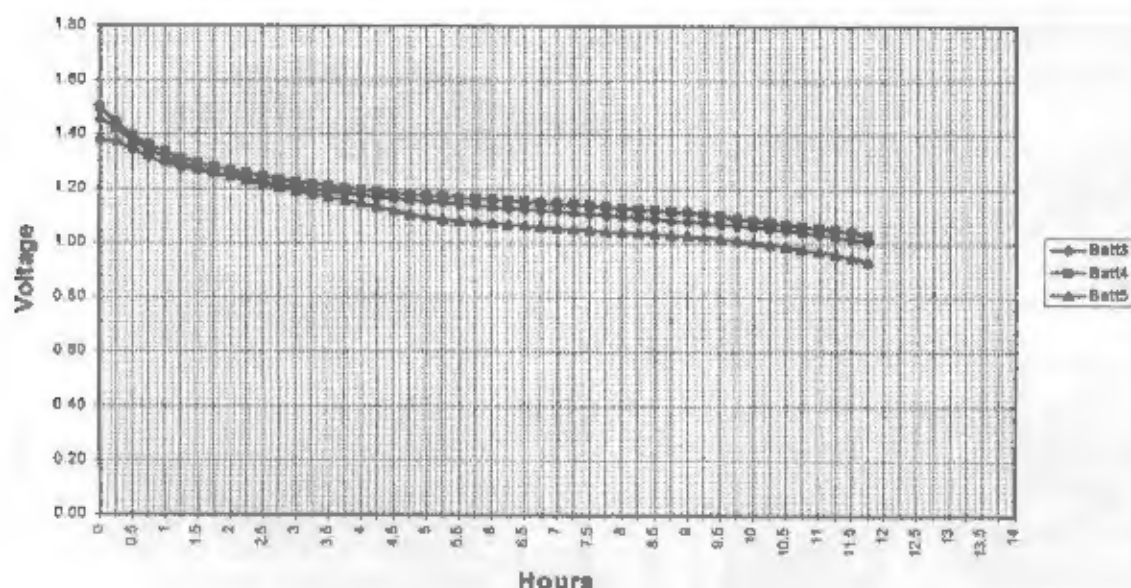
To drain the battery I needed a resistor. Because I wanted this experiment to relate to real life situations, I chose to test four different, everyday use, electronic products. I tested a Duracell flashlight, a Sony Walkman playing a tape, a Sony Walkman playing the radio, and a Sony Discman. The flashlight drew 440mA, the tape drew 102mA, the radio drew 54mA, and the Discman drew 200mA. I chose to use the Discman's current because it was in the middle of the different machines. I then used Ohm's law ($R=V/I$) to calculate the size resistor that I would be using, 7.5 ohms. I hooked a voltmeter up to my computer by the serial port, under a program called BenchLink. The voltmeter told the computer the voltage of the battery, and BenchLink recorded the voltage.



I tested three of each kind of battery (Duracell alkaline, Energizer alkaline, Energizer lithium, and Eveready Classic zinc carbon) for 12 hours, and recorded the voltage every 15 minutes. I classified each battery dead at 1.0 volts. On average, the Duracell alkaline lasted 11.25 hours, Energizer alkaline 10.4 hours, Energizer lithium 13 hours, and Eveready Classic zinc carbons lasted 1.5 hours. From my results I concluded that Energizer lithiums last the longest.

A typical plot of battery voltage versus time is shown below. Note that the battery voltage drops as the load resistor draws current from it.

Duracell Alkaline



From this data I took how long each battery type lasted and divided it by how much it cost per battery, and got the cost per hour. Eveready classics cost \$0.32 an hour, lithiums cost \$0.30, Energizer cost \$0.07, and Duracell cost \$0.06 per hour.

Discussion

While doing this experiment I realized that even though three of the batteries are made by the same company and in the same package, that doesn't mean they will all last the exact same amount of time. The Duracell batteries ranged from 10 to 11.75 hours. The Energizer alkalines lasted from 10 to 10.25 hours. I think the reason for that is they could be a variation in voltage among batteries, not every battery is perfect.

Battery	Time	Cost	Cost per hr
Duracell	11.75	\$0.75	\$0.06
Energizer	10.25	\$0.72	\$0.07
Lithium	13	\$3.90	\$0.30
Eveready Classic	1.5	\$0.95	\$0.32

Conclusion

The lithiums lasted longer than the alkalines and the alkalines lasted longer than the zinc carbon. Alkalines, in general, are the best buy because they last fairly long and cost the least per hour. Even though Eveready Classics cost the least per battery, they cost the most per hour. The Energizer lithiums cost the most per battery but lasted the longest, and only cost the second most per hour.

References

1. Duracell Corporation Web Site, <http://www.duracellnpt.com>,
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3. Friedlander, Gordon D. "Electric Circuit", *Microsoft Encarta*, Microsoft Corporation, 1993.
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